1. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 2 hours, the petri dish has 4477 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

   A. About 25 minutes

   B. About 153 minutes

   C. About 68 minutes

   D. About 11 minutes

   E. None of the above

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2. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

   The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 573 grams of element X and after 3 years there is 143 grams remaining.

   A. About 365 days

   B. About 730 days

   C. About 1095 days

   D. About 1 day

   E. None of the above

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3. A town has an initial population of 100000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	99970	99940	99910	99880	99850	99820	99790	99760	99730

A. Linear

B. Exponential

C. Non-Linear Power

D. Logarithmic

E. None of the above

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4. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 2 hours, the petri dish has 6486 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 227 minutes

B. About 22 minutes

C. About 135 minutes

D. About 37 minutes

E. None of the above

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5. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 160° C and is placed into a 11° C bath to cool. After 29 minutes, the uranium has cooled to 97° C.

A. $k = -0.02528$

B. $k = -0.02558$

C. $k = -0.01895$

D. $k = -0.02141$

E. None of the above

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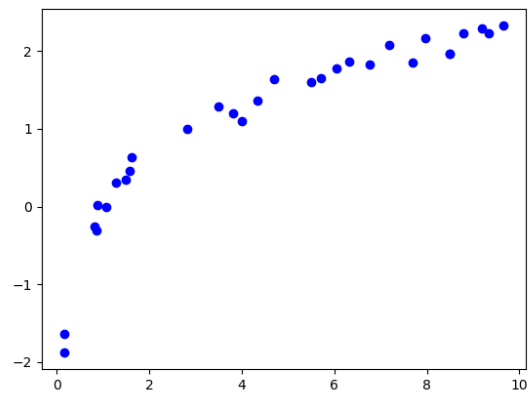
6. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Linear model

C. Logarithmic model

D. Exponential model

E. None of the above

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7. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is *initially 539 grams of element X and after 2 years there is 59 grams remaining.*

A. About 1 day

B. About 0 days

C. About 0 days

D. About 730 days

E. None of the above

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8. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 120° *C and is placed into a* 13° *C bath to cool. After 11 minutes, the uranium has cooled to* 80° *C.*

A. $k = -0.05298$

B. $k = -0.06738$

C. $k = -0.04256$

D. $k = -0.06605$

E. None of the above

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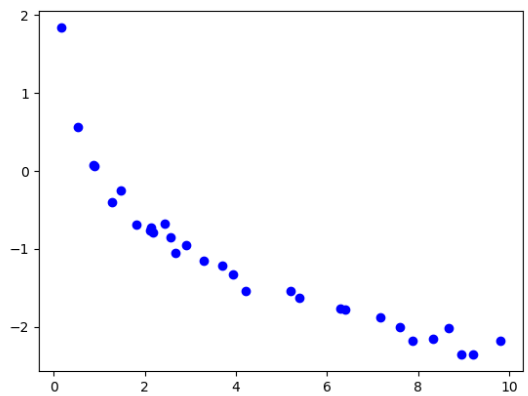
9. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Exponential model

C. Logarithmic model

D. Linear model

E. None of the above

10. A town has an initial population of 90000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	90000	90020	90032	90041	90048	90053	90058	90062	90065

A. Exponential

B. Linear

C. Logarithmic

D. Non-Linear Power

E. None of the above